

Claims

- [c1] A liquid impermeable bootie adapted to be incorporated into footwear structure, which comprises:
an inner, upper liner that is air permeable, moisture vapor transmissive, oleophobic and liquid impermeable;
and
a sole liner that is air impermeable, moisture vapor impermeable and liquid impermeable, wherein the inner, upper liner is attached to the sole liner.
- [c2] The liquid impermeable bootie according to Claim 1, wherein the liquid impermeable bootie does not leak as indicated by detectable water on the liquid impermeable bootie's exterior when applied with water having a maximum pressure of 36 milibar (0.5 p.s.i.g.) for one (1) minute.
- [c3] The liquid impermeable bootie according to Claim 1, wherein the inner, upper liner allows for air flow of at least .03 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.05 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the inner, upper liner allows for moisture vapor transmission of at least 500

grams per square meter (14.85 ounces per square yard) or more of water (H_2O) vapor in a twenty-four (24) hour period.

[c4] The liquid impermeable bootie according to Claim 1, wherein the inner, upper liner allows for air flow of at least .05 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.1 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the inner, upper liner allows for moisture vapor transmission of at least 9,000 grams per square meter (267.20 ounces per square yard) or more of water (H_2O) vapor in a twenty-four (24) hour period.

[c5] The liquid impermeable bootie according to Claim 1, wherein the inner, upper liner allows for air flow of at least .15 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.3 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the inner, upper liner allows for moisture vapor transmission of at least 15,000 grams per square meter (445.33 ounces per square yard) or more of water (H_2O) vapor in a twenty-four (24) hour period.

[c6] The liquid impermeable bootie according to Claim 1,

wherein the inner, upper liner allows for air flow of at least .51 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (1.0 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the inner, upper liner allows for moisture vapor transmission of at least 17,000 grams per square meter (504.71 ounces per square yard) or more of water (H₂O) vapor in a twenty-four (24) hour period.

[c7] The liquid impermeable bootie according to Claim 1, wherein the sole liner allows for air flow of less than .03 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.05 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the sole liner allows for moisture vapor transmission of less than 500 grams per square meter (14.85 ounces per square yard) of water (H₂O) vapor in a twenty-four (24) hour period.

[c8] The liquid impermeable bootie according to Claim 1, wherein the inner, upper liner includes a microporous membrane, wherein the microporous membrane is chemically treated from the group consisting of a fluoropolymer, a polyurethane or a fluorinated urethane.

[c9] The liquid impermeable bootie according to Claim 8,

wherein the microporous membrane includes an expanded polytetrafluoroethylene membrane.

- [c10] The liquid impermeable bootie according to Claim 1, wherein the sole liner is inelastic.
- [c11] The liquid impermeable bootie according to Claim 10, wherein the sole liner will not fully recover when deflected more than ten percent (10%) from a point of yield.
- [c12] The liquid impermeable bootie according to Claim 10, wherein the sole liner includes material selected from the group consisting of an inelastic, thermoplastic material, a fiber reinforced polymeric material and a nonthermoplastic material.
- [c13] The liquid impermeable bootie according to Claim 12, wherein the inelastic, thermoplastic material is selected from the group consisting of polypropylene, polyethylene, polyester, inelastic polyurethane, nylons and vinyl and the fiber reinforced polymeric material is selected from the group consisting of fibers of polyester, nylon, polypropylene, polyethylene, rayon, and cotton and the nonthermoplastic material is selected from the group consisting of reactive polyurethane, epoxy, styrene, butadiene, acrylics and vulcanized rubber.

[c14] A liquid impermeable bootie adapted to be incorporated into footwear structure, which comprises:
an inner, upper liner that is air permeable, moisture vapor transmissive, oleophobic and liquid impermeable and includes a microporous membrane treated with an oleophobic fluoropolymer; and
a sole liner that is air impermeable, moisture vapor impermeable and liquid impermeable, wherein the sole liner is selected from the group consisting of inelastic, thermoplastic material, fiber reinforced polymeric material and nonthermoplastic material, wherein the inner, upper liner is attached to the sole liner.

[c15] A liquid impermeable bootie adapted to be incorporated into footwear structure, which comprises:
an inner, upper liner that is air permeable, moisture vapor transmissive, oleophobic and liquid impermeable and the inner, upper liner allows for air flow of at least .03 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.05 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the inner, upper liner allows for moisture vapor transmission of at least 500 grams per square meter (14.85 ounces per square yard) or more of water (H₂O) vapor in a twenty-four (24) hour period and includes a microporous membrane; and

a sole liner that is inelastic, air impermeable, moisture vapor impermeable and liquid impermeable and the sole liner allows for air flow of less than .03 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.05 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the sole liner allows for moisture vapor transmission of less than 500 grams per square meter (14.85 ounces per square yard) of water (H₂O) vapor in a twenty-four (24) hour period and the sole liner is selected from the group consisting of inelastic, thermoplastic material, fiber reinforced polymeric material and nonthermoplastic material, wherein the inner, upper liner is attached to the sole liner.

[c16] The liquid impermeable bootie according to Claim 15, wherein the inner, upper liner includes a microporous membrane wherein the microporous membrane is chemically treated from the group consisting of a fluoropolymer, a polyurethane or a fluorinated urethane.

[c17] A process for producing a shoe construction comprising:
providing a sole;
providing an upper that together with the sole define a volume for receiving and protecting a wearer's foot against external elements; and
securing a liquid impermeable bootie, having an inner,

upper liner that is attached to a sole liner, within the shoe so that the inner, upper liner that is located underneath the upper and the sole liner is located inside the upper, wherein the inner, upper liner is moisture vapor transmissive, oleophobic and liquid impermeable and the sole liner is air impermeable, moisture vapor impermeable and liquid impermeable.

[c18] A process for producing a shoe construction comprising:
providing a sole;
providing an upper that together with the sole define a volume for receiving and protecting a wearer's foot against external elements; and
securing a liquid impermeable bootie, having an inner, upper liner that is attached to a sole liner, within the shoe so that the inner, upper liner that is located underneath the upper and the sole liner is located inside the upper, wherein the inner, upper liner is air permeable, moisture vapor transmissive, oleophobic and liquid impermeable and the sole liner is air impermeable, moisture vapor impermeable and liquid impermeable.

[c19] The process for producing a shoe construction according to Claim 18, further comprising:
securing at least one layer of textile material either outside or inside the inner, upper liner; and
securing at least one layer of textile material either out-

side or inside the sole liner.

- [c20] The process for producing a shoe construction according to Claim 18, wherein the inner, upper liner includes a microporous membrane and the sole liner is inelastic.
- [c21] The process for producing a shoe construction according to Claim 20, wherein the microporous membrane is chemically treated from the group consisting of a fluoropolymer, a polyurethane or a fluorinated urethane.
- [c22] The process for producing a shoe construction according to Claim 18, wherein the sole liner is selected from the group consisting of an inelastic, thermoplastic material, a fiber reinforced polymeric material and a nonthermoplastic material.
- [c23] The process for producing a shoe construction according to Claim 18, wherein the inner, upper liner allows for air flow of at least .03 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.05 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the inner, upper liner allows for moisture vapor transmission of at least 500 grams per square meter (14.85 ounces per square yard) or more of water (H₂O) vapor in a twenty-four (24) hour period and the sole liner allows for air

flow of less than .03 cubic centimeter per minute per square centimeter at a pressure of a 1.27 centimeter water column (0.05 cubic feet per minute per square foot at a pressure of a 0.5 inch water column) and the sole liner allows for moisture vapor transmission of less than 500 grams per square meter (14.85 ounces per square yard) of water (H_2O) vapor in a twenty-four (24) hour period.